DEPICTING THE NOOMETRIC PROFILE OF TODDLERS WITH AUTISM SPECTRUM DISORDER IN THE WECHSLER PRESCHOOL & PRIMARY SCALE OF INTELLIGENCE – THIRD EDITION (WPPSI-III)

Ilias Vasileiadis[1i],
Ioanna Dimitriadou[2],
Spyros Koutras[3],
Evangelos Vlachos[4],
Giorgos Stambliakas[5]
[1]University of Western Macedonia,
Greece
[2]University of Macedonia,
Greece
[3]Queen Margaret University,
Edinburgh, United Kingdom
[4]University of Macedonia,
Greece
[5]Aristotle University of Thessaloniki,
Greece

Abstract:

By presenting noometric tests to toddlers and young children, it is possible to depict the personal profile of every student and to designate their individual learning abilities and difficulties. The aim of this research is to determine the noometric profile of high–functioning toddlers in the Autism Spectrum, as depicted by the WPPSI-III intelligence test. A multi-methodological approach was followed for the methodological design of the paper, followed by the administration of the noometric tool to 116 toddlers who have received the relevant diagnosis and the conducting of semi-structured interviews with 105 special education kindergarten teachers who support the students in a pedagogic environment. The results of the research revealed, among other things, that the noometric abilities of infants with high-functioning ASD are lower compared to those of typically developed infants. In particular, toddlers with autism were found to have a significant statistical weakness in the knowledge of every day - practical issues, in the evaluation and use of empirical data and in the grasping of conventional rules of behavior as well as in the rate of cognitive processing. The specific findings reinforce the necessity of early

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[i] Correspondence: email il.vasileiadis@uowm.gr; ilvasileiadis@uth.gr

intervention and individualized support in toddlers with autism targeting the above deficits.

Keywords: high-functioning ASD, infancy, WPPSI-III, noometric profile

1. Introduction

The term "Autism Spectrum Disorder (ASD)" is a new category that was first used in the latest edition of the DSM (Regier et al., 2013), in order to describe a group of brain disorders that first appear in infancy and concern deficits in a child's functionality (Lord et al., 2020). The disorders included in this category share common characteristics such as problems with interpersonal communication and interaction, as well as a limited range of interests and activities, which are usually repeated (Fombonne, 2018). Autism spectrum disorders persist throughout life and usually display accompanying difficulties, such as cognitive deficits, problems in communication and learning and neurological dysfunctions (van't Hof et al., 2021). Regarding infants with high-functioning ASD, the characteristics that make up their clinical image appear in different ways in certain key areas of development. Despite the great variety in which the characteristics manifest, there are some that appear in almost all children, even earlier from infancy (Zeidan et al., 2022).

2. Literature Review

Beginning with social interaction skills, toddlers with high-functioning ASD often have difficulty interacting, cooperating, talking and playing with others. Regarding verbal and non-verbal communication, they may develop interests only in particular situations or objects without showing hetero-identification skills. It is also possible to develop obsessive behaviors. Regarding the senses, infants with high-functioning ASD may have unusually strong responses to one, or more, of the five senses (Bradshaw et al., 2017). In addition to mobility, infants with this syndrome often exhibit repetitive body movements and stereotypic behaviors. As a result, their cognitive abilities are highly uneven. They may develop special abilities in one area and difficulties in another. However, most toddlers have an unusual interest in objects, difficulty with changes in their routine, as well as with managing social situations in the school context (Miranda et al., 2017).

As part of the intercurrent characteristics of autism, it is noted that in most cases it is accompanied by intellectual difficulties (Cardinal et al., 2021). In an extensive review of related studies in the previous decade (Fombonne, 2003), findings were presented from 20 studies that examined mental function in children with an autism spectrum disorder. Although the need for caution is pointed out, due to the differences observed between the studies in terms of the extent and range of mental deficits, it appears that up to 70% of children diagnosed with autism also have accompanying mental difficulties. However, in another review of the literature (Goldberg -Edelson, 2006) 215 studies were presented, 53 of which were empirical studies, where the author, among other things, proposed the

opinion that children with autism spectrum disorder presenting high rates of intellectual disability is not supported by empirical data, or based on older research (25 years ago). Freeman & Van Dyke, (2006) further support this claim by pointing out that children with autism score low on intelligence tests due to deficits in communication and motivation. Thus, although the majority of children with ASD have severe cognitive difficulties, a percentage of 20% to 30% have an IQ within the normal range (Klin, Volkmar & Sparrow, 2000).

Noometric assessment is one of the most widely studied psychological fields, concerning students with ASD (Nader et al., 2016). An important use of IQ measurement in this student population, concerns the classification between high, average and low functioning (Audras-Torrent et al., 2021). This classification also determines the type of educational support provided to the student (Duesenberg & Burns, 2022). Functionality is an important predictor of the cognitive development of children with ASD and is essential for monitoring their progress and development (Steele, & Ahrentzen, 2015). Profile analysis of sub-scales is a common usage and interpretation of intelligence tests, particularly important in ASD (Chiang et al., 2014; Fiorello et al. 2007), which is characterized by unusual variability in cognitive performance (Dawson et al. 2007; Goldstein et al. 2008). Out of the multitude of intelligence or cognitive ability scales available to psychologists, the Wechsler scales are the most researched and widely used tests, particularly in ASD populations.

The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) is an individually administered clinical instrument for assessing the intelligence of children aged 2 years and 6 months through 7 years and 3 months (Wechsler, 1989). It maintains the tradition of the Wechsler tests, in which the results of individual subtests, as well as the total, present the mental functioning of the verbal and practical cognitive areas, while the overall result shows the general mental ability of the child (Gordon, 2004). In Greece, the 3rd edition (WPPSI III) has been calibrated and approved, which enables the calculation of the processing speed index and the general language index. For children aged 4:0-7:3 there are 7 core subtests: three verbal ones, three practical ones and one test processing speed. Information, vocabulary and verbal reasoning are the main verbal tests. The key practices tested are cube drawing, matrices and matching concepts. Coding is the core subtest of processing speed and reflects the contribution of processing speed to Intelligence (Syeda & Climie, 2014).

Regarding the performance of children with high-functioning ASD on the Wechsler scales, they usually show large discrepancies between the practical intelligence index and the verbal intelligence index, with the later being superior. The specific superiority is interpreted as a superiority of crystallized intelligence overflowing intelligence. That is, as difficult to develop favorable environmental conditions that enhance learning, despite the cognitive capabilities of the students that are captured by the measurement of cognitive potential (Mayes & Calhoun, 2008). Also recorded, are difficulties of those students to perform cognitive processing and at the same time coordinating their movements to solve non-verbal problems (Nader, et al., 2015). In addition, differences are also observed in the main subtests. In most numero-metric

assessments, students with High Functioning ASD perform better on tests that assess the auditory perception of simple verbal stimuli, comprehension of simple words, knowledge about elements of a culture, immediate mechanical recall of stimuli, short-term memory, and recalls of information (Holdnack et al., 2011). Lower performance is usually recorded in the subscales concerning knowledge of everyday, practical issues, evaluation and use of experience, knowledge of conventional rules of behavior, social judgment, social conventions and the understanding and processing of social moral rules (Oliveras-Rentas et al., 2012). The above information is drawn from the noometric profile of each toddler in order to develop targeted intervention programs.

Given the wide range of individual differences in the manifestation of autistic symptoms, a variety of early intervention and treatment programs have been developed (Devescovi et al., 2016). A review of intervention programs for children with autism spectrum disorder (Machalicek et al., 2007) mentions some goals that should be a priority in any intervention program, such as intervention starting as early as possible, being intensive, focused on social skills, individualized and relevant to the school context (Bradshaw et al., 2017). It appears that toddlers attending early intervention programs, can attend the mainstream school and do not need to attend a special education program (Roberts & Webster, 2022).

Regarding the intensity of the programs, it is estimated that it is a success factor of an intervention program (Tupou, et al., 2021). Several longitudinal studies involving high-functioning toddlers with ASD, illustrate that children who took part in intensive intervention programs showed an increase in their cognitive potential according to the results of the repeated measurements of the numerometric tests, compared to two other groups of toddlers who took part in a less intensive intervention program and no program respectively. Children from the two groups who attended the least intensive program, or no specific program, did not benefit significantly (Rodgers & South, 2021).

In Greek literature, there is no research that focuses on illustrating the cognitive profile of infants with high-functioning ASD. In addition, no research activity concerning the performance of infants with high-functioning ASD in the Greek version of the WPPSI -III can be found. Finally, no attempt has been made to connect the results of the nomometric test with the advantages and difficulties that arise for the students concerned during their kindergarten studies, in order to facilitate the scientifically based development of individualized educational programs and interventions of psychological support. The present research attempts to tackle the above research gaps with an investigation and mapping of the above variables.

3. The Present Study

The aim of this research is to investigate the performance of toddlers with high-functioning autism spectrum disorder on the WPPSI-III intelligence test. In particular, we are looking for the sub-scales in which a statistically significant ability is found, and the sub-scales in which a statistically significant weakness is found; the performances that are statistically different in the composite indicators compared to children of typical

development, as well as if there is a connection between the noometric performances and the frequency of therapeutic interventions outside the school context.

The researchers of this paper's hypotheses regarding toddlers with ADS are:
1) that their mental potential is lower compared to typically developing infants, with a predominance of practical over verbal intelligence;
2) that a statistically significant potential will be found in the cubes and matrices sub-test, while in the comprehension and verbal reasoning sub-tests a significant weakness will be shown;
3) that a significant weakness will be found in the processing speed index;
4) that the frequency of therapeutic interventions is linked to the general intelligence index.

4. Material and Method

4.1 Methodology

For the purposes of this study, a multi-methodological approach was applied. The combination of qualitative and quantitative methods does not confuse different epistemological approaches, but is defined by the objectives and conditions of the study (Miller, 2017). The multi-method approach makes it easier to manage the limitations of each individual method and allows for methodological convergence or triangulation. As a result, a better understanding of the research problem can be achieved. The various methods complement each other, enhancing the validity of the research findings (Mertens, 2014). The multi-methodological approach is often adopted in educational environments (Fetters, 2018) and can be very useful for highlighting the methods of monitoring school everyday life (Tashakkori et al., 2020) while examining the frequency and quality of the phenomena under study (Miller, 2017). For the reasons above, the multi-method approach was deemed appropriate for the purposes of this study.

4.2 Sample and Setting

The sample of this research consists of 116 toddlers who have received a diagnosis of high-functioning autism spectrum disorder from a diagnosis-assessment counseling and evaluation center (KEDASY in Greek) and are supported in the school context with a support teacher in the mainstream classroom between the years 2016-2021.

The sample consists of 88 boys (75.4%) and 28 girls (24.6%). The native language of the students is Greek and they all attend a mainstream kindergarten. 68% of the sample's toddlers studied in kindergarten and the remaining 32% in pre-kindergarten. The average age of the infants was 5.3 years (SD=0.4). Only infants with a general intelligence index above 80 were included in the sample. Infants with an IQ below 80 cannot be included in the sample because they do not meet the conditions for being classified as high-functioning infants with autism. The infants had been referred to a KEDASY center in order to provide them with appropriate educational support while attending kindergarten.

A school psychologist administered the Greek version of WPPSI-III to all the toddlers in the sample. The core subtests for ages 4:0 to 7:3 were given. Specifically, information, vocabulary, verbal reasoning, which make up the verbal intelligence index, as well as the cube design, matrices and concept matching subtests, which make up the practical intelligence index, were administered under scales. By administering the coding subtest, the general intelligence index was completed. Of the supplementary subtests, Symbol Search, Comprehension, Picture Completion, Similarity, and Object Assembling were administered to 77 toddlers in order to determine an index of processing speed. The prescribed evaluation protocol was followed by a special educator and school psychologist of the service for all toddlers.

Social workers obtained a detailed personal and social record for each infant. Data were recorded on the development of infants and the activities that they follow outside the school context. The sample included toddlers who had been diagnosed with high-functioning autism spectrum disorder by a child psychiatrist. Also, the support teachers of the students took part in the research. Some teachers were employed in more than one kindergarten during the present research, resulting in a total of 105 participants. The participating educators were all women, since in Greece, there are very few male kindergarten teachers.

4.3 Research Measures
4.3.1. Administrating the WPPSI-III Test
The administration of the noometric test was done during the evaluation process of the infants at the relevant Center for Diagnosis, Evaluation, Counseling and Support (KEDASY), individually, in a well-lit and quiet room, without distractions or interruptions. External distractions were limited and the toddler's attention was focused on the projects presented to them. The position of the examined child was such that they did not face the window and did not have access to the material that would be used during the administration. The administration table was comfortably at the right height so that the child could work easily and rest their legs. The examiner was directly opposite the infant so that they could carefully observe their behavior during the examination, while an appropriate climate of encouragement was created so that the infant felt comfortable and performed to the best of their ability. The administration process started with a small discussion about topics and activities of interest to the child so that they felt comfortable. In cases where they were shy, hesitant or fearful, they were presented with a toy and encouraged to talk about something in the room, such as a painting on the wall. It took 40-50 minutes for most infants to go through the tests.

4.3.2. Semi-structured Interviews
Two months after the start of the educational support program, semi-structured interviews were conducted with the support teachers for each toddler who had been administered the WPPSI- III test. It was deemed necessary that 2 months had passed, so that the teacher had met and familiarized themselves with the student. The interview questions were aimed at extracting information and estimates about the cognitive

abilities and weaknesses of the infants, with the aim of cross-referencing the data from the nomometric tests. The interview guide was based on the knowledge domains explored by each subtest of the WPPSI-III.

Specifically, the teachers were asked about the students' performance according to their chronological age in the following areas:

1) Neurogenic knowledge, understanding questions (Information),
2) language development, knowing the meaning of words (Vocabulary),
3) understanding spoken language, execution of analogical and general reasoning processes, processing and synthesizing of different types of information, (Verbal reasoning),
4) analysis of the whole into its individual elements, formation of non-verbal concepts (Cube Drawing),
5) solving unknown problems, formation and recognition of concepts, relationships and conclusions (Matrices),
6) categorical ability to perform reasoning processes (Concept Matching)
7) visual motor coordination (Encoding)
8) speed of visual search (Symbol Search)
9) knowledge of everyday, practical issues, knowledge of conventional rules of behavior (Comprehension)
10) ability to sequence based on the time events unfolded (Picture Completion)
11) auditory perception of verbal stimuli (Similarities), and
12) ability to predict the relationship that exists between individual elements (Assembly of Objects).

The interviews were carried out by each school psychologist who had administered the WPPSI- III test to the respective student of the support teacher. Interviews lasted from 16 to 28 minutes (average length: 21 minutes). The interviewee's behavior during the interviews was recorded. All interviews were conducted in the psychologists' offices.

4.4 Data Analysis
4.4.1. Statistical Analysis
Data from the administration of the nomometric procedure were analyzed using SPSS 21.0 statistical package. The statistical tests "one sample t-test", "paired t-test" and "Kruskal-Wallis test" were applied to investigate the existence of statistically significant differences between the sample of the present research and the weighting sample, as well as regarding the correlations with the various demographic characteristics.

4.4.2. Qualitative Analysis
The interviews were audiotaped, transcribed verbatim and checked by the participants. Educators were asked to review the interview transcripts to ensure data accuracy (Lambert, 2019). The interview data were analyzed via qualitative content analysis. The approach adopted was inductive, so that the categories would result from the data. After several reviews and open data codification, preliminary codes were noted down, using

the subject as an analytical coding unit. This was followed by an examination of the similarities and differences between the codes, so similar codes were grouped together to form the categories. The categories were then reorganized and refined, resulting in the final categories and subcategories (Roller, 2019).

5. Results and Discussion

5.1 Quantitative Results
Means and standard deviations of verbal IQ, practical IQ, general IQ, and processing speed index are shown in Table 1.

Table 1: Means and standard deviations: Verbal, Practical
and General Intelligence and Processing Speed quotient

	N	Mean	Standard deviation	t*	df	p-value
Verbal intelligence	116	96.46	10.77	-4.55	116	.000
Practical intelligence	116	96.07	10.22	-4.20	116	.000
General intelligence	116	96.33	9.82	-4.75	116	.000
Processing speed	77	94.76	13.45	-2.74	76	.000

As can be seen from Table 1, for the toddlers participating in the present research, there is no statistically significant difference in the mean between verbal IQ and practical IQ [t(115)=-0.561, p>05]. The infants of the sample display, at a statistically significant level, an average lower intelligence than the infants of the weighted sample (mean 100 and standard deviation 15) both in the general intelligence index [t(115)=-4.75, p>.000] as well as in the verbal intelligence index [t(115)=-4.55, p>.000] and in the practical intelligence index [t(115)=-4.20, p>.000]. Therefore, overall, the numerological abilities of infants with high-functioning autism are judged to be lower compared to those of typically developing infants.

Table 2: Frequency and rate of occurrence of the
difference between Verbal and Practical Intelligence

Grade difference	Frequency	Rate (%)	Cumulative percentage
0-5	45	39.0	39.0
6-10	32	26.3	65.3
11-15	22	18.6	83.9
16-20	11	10.2	94.1
21+	6	5.9	100.0

Table 2 shows the frequency and percentage of occurrence of the standard score difference between verbal and practical IQ. 65.3% of high-functioning ASD toddlers have a 0-10 point difference between verbal and practical intelligence. This difference is not considered statistically significant. A percentage of 28.8% has a difference ranging from 11 to 20 points, while a small percentage (5.2%) has a difference of 21 or more points. In relation to the direction of the difference, we note the following: 5% of the sample has the same verbal and practical intelligence index, 28% has a difference between 0 and 10

points, with practical intelligence being superior; 17% has a difference higher than 11 points, with the practical IQ being superior. 32% of the sample has a difference of 0-10 points in the practical intelligence index, while a difference of 11 points and above can be observed in the 17% of the sample, with practical intelligence being superior. In summary, 63% of the sample shows to have a higher practical IQ and 37% have a higher verbal IQ. Consequently, a reduced ability to verbally express their thoughts is recorded in the majority of infants with high-functioning ASD (Confirmation of the 1st research hypothesis).

Table 3: Means and standard deviations of WPPSI- III subtests

	N	Mean	Standard deviation	Typical error
Information	116	8.43	2.37	.21
Vocabulary	116	9.68	2.29	.25
Verbal Reasoning	116	8.18	2.46	.24
Cubes Drawing	116	9.44	2.30	.21
Matrixes	116	7.74	2.27	.23
Concept Matching	77	9.47	2.57	.26
Coding	116	8.96	2.64	.26
Symbol	77	9.40	2.88	.32
Understanding	77	10.03	2.55	.24
Filling Images	77	9.86	2.53	.23
Similarities	77	10.24	2.77	.21
Item Assembly	77	9.55	2.59	.25

As can be seen from Table 3, the lowest averages appeared in the comprehension (M=7.78, T.A.= 2.27) and verbal reasoning (M=8.11, T.A.= 2.48) tests, while the highest averages were achieved in the Cubes (M=10.25, T.A.= 2.79) and Matrices tests (M=10.03, T.A.= 2.55). The performance of high-functioning ASD children did not differ at a statistically significant level from the weighted sample on the following sub-tests: Information, Cube Drawing, Matrices, Coding, and Picture Completion. In the rest of the subtests, their performance is below the mean of the weighted sample as follows: Vocabulary [t(115)= -6.97, p> .000], verbal reasoning [t(115)= -8.27, p> .000], concept matching [t(115)=-2.31, p> .009], symbol search [t(76)=-4.51, p> .000], comprehension [t(76)= -9.31, p> .000], similarities [t (76)= -2.63, p> .04], object assembly [t(76)= -2.06, p> .04]. In conclusion, in the toddlers with high-functioning ASD group, a significant statistical potential can be observed in the formation of non-verbal concepts, in the strategic planning of how to deal with activities and in spatial ability. On the other hand, significant statistical weakness is observed in the knowledge of everyday, practical issues, in the evaluation and use of empirical data, as well as in the knowledge of conventional rules of behavior. The specific behaviors reflect the difficulties of toddlers with ASD in social understanding and interaction (Confirmation 2nd research hypothesis).

In addition, the average processing speed quotient is 95.79 (SD = 13.47). This mean falls statistically significantly short of the weighted sample mean on the processing speed quotient [t(76)= -2.74. p > .009]. Therefore, a difficulty in the rate of cognitive processing is found (Confirmation of 3rd research hypothesis).

Regarding the demographic characteristics and the daily life outside of the school context of our sample, the general intelligence index is positively related a) to the frequency of occupational therapy treatments, i.e. the more frequent the weekly treatments, the higher the general intelligence of the toddler ($x2 =10.295$, df=4, p> .05), b) to the frequency of conducting speech therapy in the same direction ($x2=12.134$, df=4, p> .05). The specific findings reinforce the necessity of early intervention and individualized support in toddlers with autism (Confirmation 4th research case).

5.2 Semi-structured Interviews

The qualitative content analysis led to the formation of the following main categories and subcategories that are listed in Table 4.

Table 4: Main Categories and Subcategories

Main Categories	Subcategories
Overall assessment of cognitive abilities	
Cognitive abilities	High visual-motor skills
	Methodology
	Adequate orientation
Cognitive weaknesses	Special interests - Absence of knowledge of daily practical skills
	Verbal expression
	Low social understanding
Slow rate of execution of cognitive tests	
Importance of personalized educational support	

The findings of the qualitative content analysis are presented below.

5.2.1 Overall Assessment of Cognitive Abilities

All participants report that students with high-functioning autism spectrum disorder show lower cognitive abilities compared to their typically developing peers.

> *"The truth is that their abilities in the cognitive field are lower if we compare them with the abilities of the rest of the children."* (34th teacher).

A large portion of the interviewees underlines that although the evaluations of infants with high-functioning autism indicate that their cognitive development is smooth, in the educational process they seem to fall behind in the management of cognitive projects compared to their peers (Confirmation of 1st case research).

> *"Yes, I understand the reference to high functioning but when compared to the rest of the students... the differences are big, they are cognitively lacking in capabilities."* (12th teacher)

5.2.2 Cognitive Abilities

Many participants believe that there are cognitive areas in which toddlers with high-functioning autism perform much better than other children of their age.

> *"Look, there are areas in which they differ, they stand out, they are much better, I'm talking about the cognitive ones, they constantly surprise us, you think you're dealing with a student who mentally is, for example, in the 4th grade."* (68th teacher)

5.2.2.1 High Visual-motor Skills

A large portion of the respondents points out that the visual-motor skills of students with ASD are particularly developed. They consider that in this field they stand out in the class.

> *"The area I stand out is visual-motor skills. His speed is awesome, and he surpasses not only his classmates but many toddlers I've taught in the last 6 years now I've been working in kindergarten."* (79th teacher)

5.2.2.2 Methodology

Interviewers deem students with high-functioning autism to behave like little scientists. The way they think is distinguished by method and systematization.

> *"What can I say? He tries to solve any task with a method. He leaves nothing to chance, the truth is that he reminds me of an inventor or a little scientist."* (102nd teacher)

5.2.2.3 Adequate Orientation Skills

Other interviewees are convinced that the strong point of the cognitive development of infants is good orientation, to an extent that often exceeds the skills of adults in this area.

> *"Personally, I single out his very good orientation skills, not only in the area around the school and the classroom but elsewhere as well. We may have been somewhere on an excursion and he can clearly describe to me how we will go there again. Honestly, I have never seen anything like this before. I only remember one older student of mine who was on the autism spectrum with such skill."* (26th teacher)

5.2.3 Cognitive Weaknesses

It is a common belief of all participants, that students with high-functioning autism display significant cognitive weaknesses compared to the expected cognitive development for their age.

> *"Of course, there are areas that are they are lacking in. I think they fall further short of a typically developing student in many cognitive domains. In other words, it is not that they have some strong and some weak points, like all students. The toddlers on the autism spectrum, that I have taught, display more cognitive weaknesses."* (46th teacher)

5.2.3.1 Special Interests -Lack of Knowledge of Everyday Practical Skills

The respondents point out the inability of toddlers with high-functioning autism to manage many issues of everyday school life, due to the absence of practical skills. They believe that their special interests and one-sided engagements, absorb the attention of the students and as a result, there is no time available to train in practical skills, that are necessary in kindergarten (Confirmation of 2nd research case).

"I notice that he is very much occupied with his own personal interests, like wind power or dinosaurs. However, the amount of time he devotes to his interests, gives me the impression that it prohibits him from developing other skills that are necessary in our daily lives. He doesn't tidy up his toys, he can't even put things in and take things out of his bag, he won't pay any attention to what I say to his work group." (55th teacher)

5.2.3.2 Verbal Expression

A significant portion of the interviewees believes that the verbal expression of infants with ASD is, in many cases, incomplete. They find it very difficult to communicate, so they remain silent and socially isolated.

"I notice the greatest weakness is in his verbal expression. There are times when he cannot express himself and cannot be understood. Not because he has any articulation difficulties, but because there is something like confusion. He cannot define some concepts that at this age it is expected that he should be able to. He can't even express his feelings easily, always comparing himself to the other children in the class." (81st teacher)

5.2.3.3 Low Social Understanding Skills

Other educators focus on the fact that toddlers with high-functioning autism have difficulty understanding the prevailing social conditions that govern the operation of the kindergarten. This particular difficulty results in them managing their social interaction with their classmates in a non-functional way. As a result, this causes typically developed toddlers to avoid interacting with their schoolmates with ASD.

"There are many social conditions that he cannot perceive and I am not talking about complex situations but about very simple conditions. For example, the fact that we stop when someone is injured or when someone feels discomfort. At least this is how I understand it. All this accumulates and, you know, kids can be cruel and many of them don't want to sit next to him or hang out." (25th teacher)

The above qualitative analyzes confirm the 2nd research hypothesis.

5.2.4 Slow Rate of Execution of Cognitive Tests

For the great majority of interviewed teachers, infants with ASD show a slow pace in the execution of cognitive tests, compared to the pace of typically developing infants. (Confirmation of 3rd case research).

"The execution speed of cognitive tests is very, very slow. From his assessment, I can see that his mental potential is good but his speed is very slow. He reminds you of a mentally challenged student. I don't know where to attribute it. In the class there are students who are cognitively less efficient and yet, their speed is faster in processing information." (92nd teacher).

5.2.5 Importance of Personalized, Educational Support

All the teachers point out that it is important to support infants with high-functioning autism during the afternoon hours with individual speech therapy, occupational therapy and psychological support. Several teachers focus on the importance of early intervention for the cognitive development of these students. (Confirmation 4th research case).

"I understand that there is not much support in kindergarten and you can see the difference in students with high-functioning autism who are supported with occupational therapy, speech therapy, or have a psychologist. It is also no coincidence that children who followed early intervention programs, are much more functional and benefit much more from the educational process in the classroom." (73rd teacher)

5.3 Discussion

The purpose of this research was to determine the noometric profile of infants with high-functioning autism spectrum disorder, as reflected in the WPPSI- III intelligence test. The results of the research showed that the indicators that determine the general cognitive ability of infants with high-functioning ASD are lower, compared to the corresponding indices of infants with typical development. Also, toddlers with high-functioning autism, display special cognitive abilities in the development of strategic, activity-management plans. On the contrary, they show difficulties in recognizing conventional rules of behavior and dealing with everyday practical matters. In addition, difficulties emerge in the rate of cognitive processing, compared to the rates of typically developed infants. Finally, the research confirmed the importance of early intervention programs for a more efficient cognitive development of students with high-functioning autism spectrum disorder.

Analysis of the data showed that infants with high-functioning ASD, compared to peers with typical development, present an overall profile with lower cognitive abilities. This specific research finding is also confirmed by earlier research studies which, among other things, report on how the cognitive abilities of infants with high-functioning ASD are lower compared to the corresponding abilities of typically developed infants. At the same time, they are predicatively associated with learning difficulties in elementary school (Mayo & Eigsti, 2012). Comparable findings are also found in other research data, which demonstrate that autism is commonly associated with other spectrums of developmental abnormalities, including general cognition, behavior, speech and language, motor control, executive function, and concentration. Infants with high-functioning autism typically demonstrate fewer combined difficulties in the aforementioned domains (Fernell et al., 2010).

Regarding the comparison of auditory-linguistic and visual-motor skills, the results of the present research highlight that the difficulties of infants with high-functioning ASD are mainly found in language and verbal skills. This finding may be explained by the strongest effects of language delay found in younger children with high-functioning autism (Stone et al., 2007). A study of 52 toddlers with autism and 54 typically developed toddlers, ages 31 – 77 months, found similar results. Infants were assessed with the Mullen Scales of Early Learning (MSEL), the Wechsler Preschool and Primary Scales of Intelligence (WPPSI-IV), the Raven's Colored Progressive Matrices (board form) (RCPM), the Children Embedded Figures Test (CEFT) and the Visual Search Task (Joseph et al., 2002) tests. Thus, it appears that this relative weakness in verbal ability exhibited by younger and more able children with autism, is to some extent dependent on age and possibly reflects the effects of developmental delays in speech and language, which diminish with age in some children over time (Joseph et al., 2002). Language abilities are one of the most variable characteristics of individuals with autism. Toddlers with ASD show significant delays in language development, in relation to their age and their parents' expectations. Delays concern both receptive and expressive language. They often show early language delays, regardless of their non-verbal cognitive level. There is considerable individual variation in language development within the autism spectrum (Ellis-Weismer et al., 2010).

Children with autism tend to engage in conservative conversations, in excessive questioning and in the use of stereotypical language while talking. Difficulties in choosing appropriate topics for discussion and making decisions about what to say and what is relevant to the conversation are noted. (Towgood et al., 2009). The major difficulties are found in starting and maintaining conversations that are focused on others' interests and prior knowledge. Conversely, children with functional autism, when discussing their own special interests, demonstrate much better performance. Results like the above appear in a study conducted on 171 children, aged 3-6 years, who were given an experimental scenario of free play and administered the Pragmatic Rating Scale-Young and General Assessment of Conversation Quality (Bauminger-Zviely et al., 2013). The findings of the above research conclude that children with ASD show a significant delay in their language development and communication. In the intra-individual cognitive profiles, there is enough variety and heterogeneity in terms of the cognitive capabilities and weaknesses they display (Vaivre-Douret & Planche, 2020).

However, from the present research, particular cognitive possibilities emerge regarding the development of strategic activity management plans. Cognitive functioning is an important predictor of outcomes in ASD and it is essential to study it in order to monitor the progress and development of infants (Zwaigenbaum et al., 2007). School-age children with ASD score lower on the Freedom from Distractibility Index (FDI, replaced by the Working Memory Index, or WMI on the Wechsler Intelligence Scale for Children, Fourth Edition [WISC-IV]) and the Processing Speed Index (PSI), when compared with the Verbal Comprehension Index (VCI) and the Perceptual Organization Index (POI; named Perceptual Reasoning Index, or PRI on the WISC-IV). Children with high-functioning autism have strong points in visual reasoning and weaknesses in

attention, grapho-motor skills, and processing speed (Oliveras-Rentas et al., 2012). Children with high-functioning autism demonstrate better performance in nonverbal and practical activities, than in verbal ones. In particular, attention, grapho-motor coordination and processing speed are found at low levels, in contrast to their strong points of verbal and visual reasoning (Mayes & Calhoun, 2008).

Subsequently, the research data of the present research showed that the participating toddlers present difficulties in their social development. In particular, it was shown that infants with high-functioning ASD present difficulties in social understanding and adaptation. General research data is consistent with this assumption. In addition to difficulties in social situations and restricted and repetitive behaviors, many children with autism also experience language deficits, behavioral problems, and difficulties in adaptive behavior (Zheng et al., 2019). These difficulties are related to poor communication skills. Behavioral problems are thought to "serve" communicative functions such as avoiding unwanted activities and obtaining social attention, objects or activities (Narvekar et al., 2022). The important question is: "Does the understanding or use of communication, matter in dealing with the above behavioral problems?". Effective receptive communication is associated with adaptive behavior (daily living and social skills) and specific types of behavior problems (self-absorbed behavior and social relationships) (Park et al., 2012). Children with functional autism score particularly low in tests related to social understanding and adaptation, as shown by Oliveras-Rentas et al., (2012), in which 56 children with autism participated (including 22 children with ASD) and were administered the Vineland Adaptive Behavior Scale, Second Edition: Survey Interview Form and the Wechsler Intelligence Scale for Children–Fourth Edition. Regarding the speed of processing, the results of this research point out that students with ASD lag behind, compared to students of typical development. The specific findings reinforce the results of previously available research. Clear and consistent deficits in processing speed (either on the PSI or on its constituent subtests) are observed in children with ASD. However, it is unclear whether this relative weakness reflects true cognitive processing speed, motor speed difficulties, or likely both (Oliveras-Rentas et al., 2012). Slow processing speed can cause problems with learning rate, understanding new information and mental fatigue. Mayes and Calhoun's (2008) study showed that deficits in learning, attention, grapho-motor processing, and processing speed tend to be present in high-functioning autistic children. Processing speed deficits are expected to affect many daily activities that require the timely completion of tasks and the assumption of responsibilities and are, therefore, a cognitive factor of great importance in everyday life. Specific deficits are in many ways "invisible". Children with ASD and normal IQ, but with difficulties in processing speed, may fail to complete expected tasks, if this problem is not recognized. This however does not have to be a result of ASD "in itself". Deficits in processing speed are common to many ESSENCE conditions and this highlights the cognitive overlap of many of these disorders and the need for a broader perspective when assessing children with different kinds of developmental disorders (Hedvall et al., 2013).

Finally, from the findings of the research, it is clear that toddlers with high-functioning autism who follow speech therapy and occupational therapy programs are

more facilitated in the development of their cognitive skills. The specific programs are offered as part of early intervention programs. Research shows that many children with ASD may experience significant benefits in cognitive and social-behavioral functioning from early intervention services (Lord et al., 2020). By identifying preschool skills predictive of school-age achievement, it may be possible to further tailor early intervention and education strategies, to maximize later academic achievement in this population (Machalicek et al., 2007). Early functioning can predict subsequent academic performance. This finding would allow professionals working with young children with ASD to formulate appropriate guidelines for the child's education in the future and, perhaps most importantly, to identify early intervention strategies that would potentially maximize later academic success in that population. Individuals with ASD may benefit from learning, repetition, visual representations, and hands-on instruction to build basic academic skills (i.e., decoding, vocabulary, numeracy), while more specialized instruction in inferential and pragmatic language use can encourage the development of weaker areas (i.e., reading comprehension). Furthermore, the results of the data analysis suggest that later academic functioning can be substantially affected by intervention in language and motor skills during the preschool period (Miller et al., 2016).

Previous research has also documented the importance of prelinguistic skills, such as joint attention and imitation in language development and social functioning. As mentioned earlier, numerous studies have identified strong associations between early behavior difficulties and academic and social functioning in school. Children with persistent behavior problems at a young age will experience both cognitive/learning and social difficulties later in school (Zaidman-Zait et al., 2020).

6. Recommendations

In the present research, there are methodological limitations that must be considered, when interpreting the results. First of all, the sample of the research was small, from a single geographical area, therefore the safer generalization of the results is not allowed. Another limitation was the lack of application of more complex statistical methods and qualitative analysis with the participation of general education teachers. Also, the lack of more data in order to cross-reference the results with the administration of weighted tools concerning the cognitive and social development of infants is considered a weakness of the research. Finally, the comparison of the results was made with the weighted sample, limiting the increase in the reliability of the present research. It was not possible to compare the results with the results of a sample of the typically developed classmates of the students with ASD. Thus, it was not possible to compare the qualitative data from any interviews of the general education teachers of the classes attended by the students in our sample, and which would concern the cognitive abilities of both students with ASD and without.

From the aforementioned limitations, but also based on the conclusions obtained from the present research, perspectives emerge for further research with particular theoretical and research interests. Initially, it will be interesting to quantitatively and

qualitatively investigate the compared phenomena beyond the time frame of attending kindergarten, and in a subsequent phase in the middle of elementary school, in order to compare and draw generalized conclusions. Also, it would be helpful to investigate whether factors such as parents' socioeconomic status, gender, or the child's extracurricular activities are related to the predominant noometric profile of high-functioning ASD students. Finally, the research was conducted with the participation of students with high-functioning ASD. It would be important to investigate the hypotheses of the present research with the participation of students with moderate and low-functioning autism in order to adequately determine the noometric profile of all infants with ASD.

7. Conclusion

With the present research, subtests and indicators of the noometric test WPP were highlighted, which capture some of the usual characteristics of infants with high-functioning autism. Administering this specific intelligence test during infancy may facilitate the early detection of findings associated with ASD. Also, the findings that make up the noometric profile of students with ASD are reinforced. The potential of the specific students is recorded in specific areas under the study of the noometric tool, such as in the development of strategies for solving the cognitive tests (see under tests cubes and matrices) and also their difficulties in the development of audio-verbal skills and social understanding skills (see subtests comprehension and verbal reasoning). In addition, the difficulty of people with ASD, from their infancy, in developing a sufficient rate of execution of cognitive tests (see processing speed index) is highlighted, even though the mental potential of the specific students is determined in the context of the normal. It is confirmed that the mental profile of students with ASD is not uniform but it is characterized by many contradictions, that are interpreted by the range of characteristics and symptoms of the specific developmental disorder. Finally, this research reminds the reader of the importance of personalized therapeutic support and its contribution to the cognitive development of infants in all areas.

Conflict of Interest Statement
The authors declare no conflicts of interest.

About the Authors
Dr. Ilias Vasileiadis ® (https://www.researchgate.net/profile/Ilias-Vasileiadis-3) ⬤ (https://orcid.org/0000-0002-7625-1709) is a school psychologist. He is a lecturer at the University of Western Macedonia and the Aristotle University of Thessaloniki. He participates in research projects. It also designs scientifically proven interventions for social and emotional support of students.
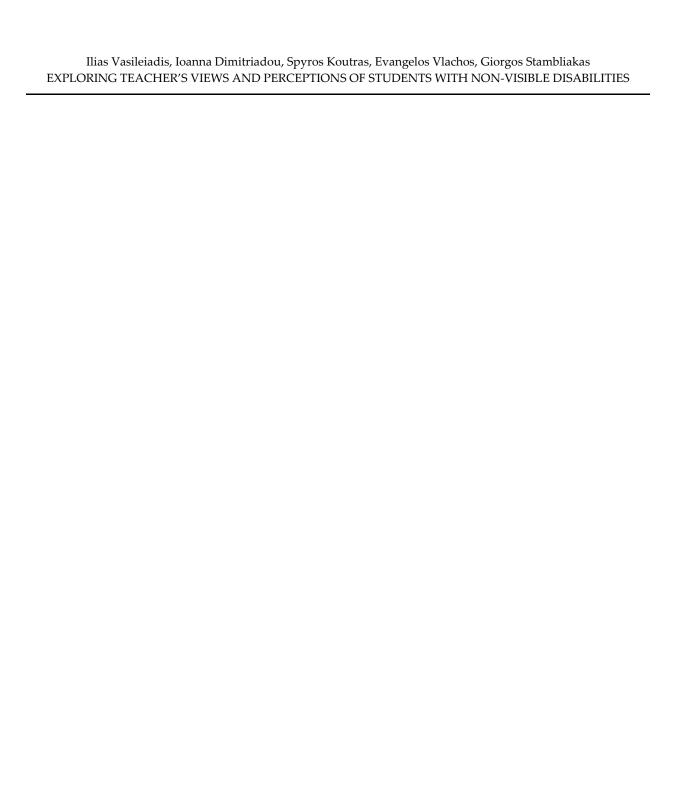
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